

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

# **Fiscal Policy and the Current Account: Evidence from South Africa**

Peter Searle

SRLPET003

Supervisors: Dr. Albert Touna Mama and Kevin Kotzé

*This submission is a partial requirement for the fulfilment of the Master of Commerce (Applied Economics) degree.*

---

## **Abstract:**

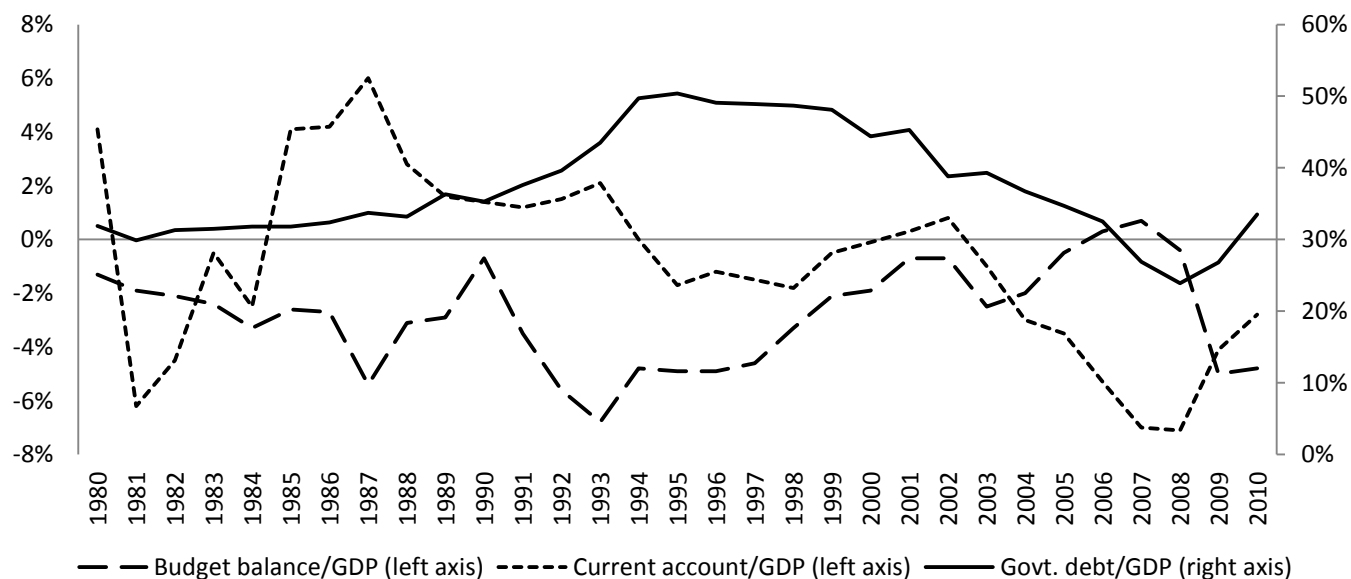
This paper investigates the link between fiscal policy and the current account in post-apartheid South Africa using Bayesian-Vector Autoregressions (BVARs). Consistent with the predictions of the twin deficit hypothesis, the analysis reports a strong positive relationship between the government budget balance and the current account. In addition, shocks to output growth are also found to improve the current account balance persistently. These two responses are further explored and accounted for in a breakdown of the current account into its private and public saving and investment components.

---

# 1 Introduction

Global imbalances – the large deficits and surpluses on the current and capital accounts of major world economies – are probably the most complex macroeconomic issue facing economists and policy makers.<sup>1</sup> Prior to the 2008 financial crisis, the magnitudes involved were sobering and posed a significant threat to the stability of the world financial system.<sup>2</sup> The crisis, and resulting recession, brought somewhat of a reduction in these imbalances as saving and investment patterns shifted globally. The past two years, however, have seen a return to the worrying trends that existed before. As Blanchard and Milesi-Ferretti (2009) argue, current account balances represent a plethora of macroeconomic and financial mechanisms. The evolution of these balances can be derived from a number of factors such as the conduct of fiscal policy, persistent foreign exchange rate misalignments between trading partners and domestic and foreign saving and investment dynamics. This paper focuses on the first of these factors in South Africa and investigates the link between fiscal policy and the current account in the post-apartheid era.

Figure 1: Public debt and the fiscal and current accounts



Source: South African Reserve Bank (SARB) Quarterly Bulletins<sup>3</sup>

On opposing ends of the current account imbalances, it has generally been emerging market economies that have possessed the surpluses to the major developed economies' deficits. South Africa, however, provides an interesting exception to this rule in the behaviour of its current account balance. Illustrated in

<sup>1</sup> (Blanchard & Milesi-Ferretti, 2009)

<sup>2</sup> (Manuel, 2008)

<sup>3</sup> Budget balance/GDP represents the national government deficit/surplus as a per cent of GDP. Current account/GDP is the ratio of the current account balance to GDP. Govt. debt/GDP represents total national government debt as a per cent of GDP.

figure 1, South Africa has recorded persistent deficits in its current account since mid-2003. In fact, between 2005 and 2009, the country recorded the highest average current account deficit-to-GDP ratio of all the G20 countries. This figure stood at 5.4 per cent of GDP, outstripping the much spoken of U.S. current account deficit, which stood at 4.9 per cent between these years.<sup>4</sup> It is thus not surprising that concern over South Africa's external balance and its sustainability arose.

In the post-apartheid era, fiscal policy has been largely influenced by a radical policy shift which saw a step-wise reduction in the budget deficit and a marked improvement in the country's public debt position. This paper investigates the relationship between this fiscal policy and the current account using Bayesian-Vector Autoregressions (BVARs). Whether South Africa's external positions have been affected by fiscal decisions is certainly a question of policy and empirical interest. To the best of our knowledge, no other study has considered the link between fiscal policy and the current account in South Africa in a dynamic multivariate setting. The results reported by the BVAR show a strong positive relationship between budget balances and the current account in the sample. In addition, we find that shocks to output growth improve the current account balance persistently.

The remainder of the paper is organised as follows. In section 2 we describe the recent history of South Africa's fiscal policy and current account. Section 3 considers the theoretical links between the fiscal and external accounts and summarizes the relevant literature on the twin deficit hypothesis. Section 4 describes the data and conducts preliminary tests. Section 5 discusses the BVAR methodology. Section 6 analyses the impulse responses derived from the BVARs. Section 7 considers the robustness of the results and section 8 concludes.

## **2 Background**

### *2.1 Recent Fiscal History*

Following the country's transition to democracy, the new government sought to address the large fiscal imbalances and rapid debt accumulation of the previous regime. Existing imbalances were not only of a financial nature but were also manifested in the massive backlog of services not delivered to the previously disenfranchised. The new government aimed to address these issues with the adoption of a new macroeconomic framework in the form of the Growth, Employment and Redistribution (GEAR) strategy that was formulated in 1996. Among its other endeavours, this strategy pursued macroeconomic

---

<sup>4</sup> (Shirakawa, 2011)

stability, improved social support to the poor and growing the South African economy with an outward-oriented focus.<sup>5</sup>

Among the developmental aims of the framework, macroeconomic stability stood as the key undertaking especially in light of the opening of the economy to the vagaries of the global market place.<sup>6</sup> Central to achieving this stability was the consolidation of the fiscal accounts and the reversal of the growth in public debt. Between 1985 and the mid-1990s, fiscal policy in South Africa was guided by a 3 per cent deficit rule but this guideline had no theoretical basis and did not prevent the unsustainable deficits of the 1992 and 1993 fiscal years.<sup>7</sup> These deficits contributed to the heightened level of public debt accumulation prior to the shift in political regime. In 1995, the general government debt-to-GDP ratio stood at 50.4 per cent with interest payments soaking up a significant portion of the budget. Public debt management thus took centre stage in the government's bid to release the resources required for education, healthcare, housing and infrastructure spending. As figure 1 illustrates, the efforts of the fiscus in the step-wise reduction of the budget deficit were largely successful as the deficit gradually improved from 6.8 per cent of GDP in 1994 to 1.9 per cent in 2000. The reduction in the stock of debt was also aided by the full and partial privatization of several state-owned enterprises, of which a significant portion of the proceeds were used to reduce the government's debt obligation.<sup>8</sup> The above allowed for increased social spending, averaging over 60 per cent of government expenditure over the 1996-2000 period.

Following the fiscal restructuring, which contributed to a more stable macroeconomic environment, fiscal policy shifted to a more growth-oriented stance in the 2001 budget. This involved improved spending, significant increases in infrastructure allocations and on-going tax reform within the sound framework of fiscal management that had been established over the previous five years.<sup>9</sup> All the while significant increases in infrastructure expenditure were taking place, budget deficits averaged a modest 1.3% of GDP between 2001 and 2006 with small surpluses being recorded in 2006 and 2007. This could be put down to the robust growth in the world and domestic economy and the vast improvement in tax collection administered by SARS.<sup>10</sup> Further privatization between 2000 and 2003 continued the steady reduction in the state's stock of debt. All of the above saw it registering its lowest level in 2008 at 23 per cent of GDP – less than half of the debt ratio inherited in 1994.

---

<sup>5</sup> (Department of Finance, 1996)

<sup>6</sup> That being said, opening markets can also better allow a country to smooth consumption which can increase stability.

<sup>7</sup> (Siebrits & Calitz, 2004)

<sup>8</sup> South Africa's privatisation programme began with a slow start in 1997. The pace of state asset restructuring picked up post-2000 after a review of the policy in 1999 by various stakeholders (Afeikhena, 2004).

<sup>9</sup> (Manuel, 2001)

<sup>10</sup> (Manuel, 2008)

Following a small budget deficit of 0.4 per cent of GDP in 2008, 2009 and 2010 brought deficits in the range of 5 per cent of GDP. The latter two years' reduced balances were naturally as a result of declines in tax revenue brought about by the global recession.<sup>11</sup> Despite the significant decline in revenues, spending on social and economic services and infrastructure development was maintained during these years to partially offset the impact of the recession on local output and living conditions.<sup>12</sup> The government was only able to affect this counter-cyclical fiscal stimulus as a result of the sustainable fiscal positions it had fostered over the previous decade. These fiscal positions have, however, brought increases in the government debt-to-GDP ratio which stood at 26 and 33 per cent for 2009 and 2010 respectively. The fiscus has indicated that the medium term expenditure framework will allow for a gradual reduction in the budget deficit following these years of debt re-accumulation.<sup>13</sup> This will be crucial if the debt service cost is to cease being the fastest growing budget element that it is now.

In summary, South Africa's fiscal story over the past two decades is one of radical policy shift that has changed the course of spending patterns, debt management and arguably the economy as a whole. The early focus on macroeconomic stabilization and addressing the service backlog between 1996 and 2000 was given a distinct growth emphasis in the years that followed. A continuation of improvements in the budget balance and further reductions in government debt were supported by heightened levels of economic growth and state-owned enterprise privatisation. The fiscal stances of exception in 2009 and 2010 stand as reminders of South Africa's union with the global economy but can be viewed with limited concern insofar as they are transitory. The history of fiscal policy in South Africa since 1994 can therefore be argued to be one of exemplary achievement along the dimensions of fiscal prudence, debt reduction and the improved transfer of resources from the rich to the poor.<sup>14</sup> We now turn to a brief discussion of the behaviour of South Africa's current account.

## *2.2 The Current Account*

The experience of South Africa's current account in figure 1 stands in some degree of contrast to that of the budget balance. A keen observer will note, that while the budget balance-to-GDP ratio has experienced an unambiguous upward trend, the trend in the current account since apartheid ended has been largely negative. Following the surpluses of the late 1980s and early 1990s - due chiefly to the sizeable trade surpluses and departing foreign capital - the current account slipped to a deficit in 1994. The subsequent deficits between this institutional shift and 2000 were of limited size and provided little

---

<sup>11</sup> (Gordhan, 2011)

<sup>12</sup> Planned public infrastructure spending under the 2009 MTEF remained at R787 billion for the subsequent 3 years (National Treasury, 2009).

<sup>13</sup> (Gordhan, 2011)

<sup>14</sup> (Du Plessis, Smit & Sturzenegger, 2007)

cause for apprehension in policy makers. Following the small surpluses of exception in 2001 and 2002, however, growing current account deficits were recorded and their sustainability became a concern. 2007 and 2008, for instance, brought the largest deficits of this interval of 7.0 and 7.1 per cent of GDP respectively.<sup>15</sup> Smaller deficits of 4.1 and 2.8 per cent in 2009 and 2010 have been recorded but the deficit is forecasted to grow to 5 per cent of GDP within the coming three years.<sup>16</sup>

Outside of sustainability concerns, the current account is a macroeconomic balance of vital importance in that it acts as a tool by which the country can smooth current and future consumption. In the short run, it can be used to finance heightened levels of consumption and investment and this is particularly true in the post-1994 South African case. From this perspective, current account deficits should not be viewed in a purely negative light in that they may be applauding of a country's ability to attract foreign capital.<sup>17</sup> However, large and persistent deficits can place countries in danger of experiencing sudden stops in capital flows and current account reversals.<sup>18</sup> The Asian financial crisis and several South American countries' experiences have illustrated how such events can be particularly harmful to a developing country's growth experience.

Prior to the financial crisis, the IMF regarded global imbalances as one of the greatest threats to the world economy.<sup>19</sup> Of particular interest to the Fund were the large current account and arguably related fiscal deficits of the U.S. and the role that China played in the former. Mentioned above, South Africa's current account has also not escaped debate surrounding its sustainability. Whether South Africa's fiscal policy impacts on the current account in a systematic manner is, therefore, an important question with potential policy implications. Useful for the purposes of this paper, there exists a literature investigating the link between budget and current account balances based on the twin deficit hypothesis. We therefore progress to summarize the relevant twin deficit literature and explain the theorized linkages between fiscal policy and the current account.

### **3 Relevant Literature**

The notion of the twin deficit hypothesis can be traced back to the early 1980s when the U.S. current account followed the budget balance into a deficit. With the exception of a small surplus in the current account in 1991, the 'twin deficits' persisted until the Clinton years when several budget surpluses were achieved. Much debate was sparked and a large literature developed attempting to account for this

---

<sup>15</sup> This paper does not consider the sustainability of South Africa's current account balances in specific detail. For a full discussion of the topic, see Searle and Touna Mama (2010), Draper and Freytag (2008) and Smit (2007).

<sup>16</sup> (Gordhan, 2011)

<sup>17</sup> (Searle & Touna Mama, 2010)

<sup>18</sup> (Edwards, 2004)

<sup>19</sup> (Blanchard & Milesi-Ferretti, 2009)

supposed relationship. Certainly from a policy perspective, the effect of persistent budget deficits on the U.S. external account posed a critical question given their magnitude.<sup>20</sup> As is discussed, theory strongly supports a link between these two balances but the empirical evidence is less convincing.

From the simple identity which states the current account equals savings less investment, one can decompose saving into its private and public counterparts.

$$CA = \text{Private saving} - \text{Investment} - (\text{Government spending} - \text{Tax receipts}) \quad (3.1)$$

From the above equation it can be seen that for given levels of private savings and investment, an increase in the budget deficit will decrease the current account balance. More specifically, if one finds that domestic saving and investment move closely together as is suggested by Feldstein and Horioka (1980), we could expect the budget balance and current account to have a strong positive correlation. These considerations aside, conventional theory predicts that the two deficits are ‘twinned’. The proposed macroeconomic linkages connecting the deficits are, however, less clear from the above equation and are twofold.

Based on the well-known Mundell-Fleming framework, the Keynesian view is that budget deficits can influence the current account either directly or indirectly. The direct effect sees increases in government spending (holding taxes constant) increase domestic absorption, which in turn boosts imports and worsens the current account. A number of papers have found evidence in support of this channel and they include both developed and developing country analyses. For instance, Ziets and Pemberton (1990), Bachman (1992), Dibooglu (1997) and Leachman and Francis (2002) find evidence of U.S. budget deficits and current account deficits being linked through domestic absorption. Leachman and Francis (2002), however, found this relationship to be time specific and weak in their post-1974 data. In a broad study, Daly and Siddiki (2009) investigate the impact of budget deficits and real interest rates on the current account in 23 OECD countries. Extending the existing literature’s empirical modelling by allowing for regime shifts in the cointegration analysis, the paper reports twin deficit type relationships in 13 of the 23 countries when regime shifts are permitted.<sup>21</sup> Vamvoukas (1997), Khalid and Guan (1999), Kouassi, Mougoué and Kymn (2004) and Baharumshah, Lau and Khalid (2006) find significant support for this channel in several developing economies.

---

<sup>20</sup> Contrary to the analyses on U.S. fiscal policy expansions, we consider the impact of fiscal consolidation in a small, and now open, economy.

<sup>21</sup> In the models run not permitting regime shifts, only 7 countries report cointegrating relationships. The authors therefore argue that studies neglecting to control for structural breaks in a cointegration framework may be biased in favour of accepting the Ricardian Equivalence Hypothesis.



Mentioned above, the Mundell-Fleming framework also suggests an indirect channel through which current account balances may be impacted by fiscal policy. Within this, a bond-financed fiscal expansion is argued to raise real interest rates. These higher real interest rates attract foreign capital which appreciates the domestic currency. The appreciation induces imports to grow relative to exports and a lowering of the current account occurs. The above would, of course, be the case under a flexible exchange rate regime. Under a fixed exchange rate, interest arbitrage requires the equality of domestic and foreign interest rates. Thus, a fiscal expansion translates into a rise in income and/or prices which both reduce the current account balance.<sup>22</sup> Evidence in support of this link between the deficits is scarce with only Abell (1990) with 1979-1985 U.S. data and Ibrahim and Kumah (1996) with data from four other developed economies finding such a result.

Interestingly, reverse causality between the deficits is a relatively common result. Darrat (1988) for the U.S. and Kearney and Monadjemi (1990) for the U.S. and seven other developed economies found significant feedback between budget deficits and current (trade) account deficits respectively. Islam (1998), Anoruo and Ramchander (1998), Baharumshah *et al.* (2006), Pahlavani and Saleh (2009) and Kouassi *et al.* (2004) show this result to be more common in a developing country context. Kouassi *et al.* (2004) employs bivariate Toda and Yamamoto (1995) Granger non-causality tests between budget deficits and current account deficits in 10 developed and 10 developing countries, with South Africa forming part of their developing country sample. With annual data covering the period 1976-1998, they find that reverse causality exists between South African budget and current account deficits. Unfortunately, the bivariate analysis is not illuminating of the macroeconomic linkages between the balances. This is an area in which this paper seeks to make a contribution. The exact interpretation of such causality is also unclear with some authors arguing that domestic hardships brought about by unfavourable external accounts induces government expenditure in excess of revenue. Baharumshah *et al.* (2006) provide an alternative and possibly more realistic interpretation of this causality. This being that current account or trade balance deterioration leads to a slower pace of economic growth, which dampens government revenue, inducing a fiscal deficit.

One final supposition surrounding the twin deficit debate centres on the notion of the Ricardian Equivalence Hypothesis (REH) which holds that the two deficits are more distant cousins, if not entirely unrelated.<sup>23</sup> Under Ricardian equivalence, a budget deficit is perceived by domestic agents as an increase in future taxes required to finance and retire the increased debt. Domestic participants, seeking to smooth consumption, increase their saving to offset the discounted future tax increases. Intertemporal

---

<sup>22</sup> (Dibooglu, 1997)

<sup>23</sup> (Mohammadi & Skaggs, 1996)

optimisation of the general public renders a fiscal expansion having no effect on the current account balance, either through the direct or indirect channels discussed above. Enders and Lee (1990), Mohammadi and Skaggs (1996) and Normandin (1999) find evidence in support of the REH holding in the U.S. in the context of the two deficits. Kaufmann, Scharler and Winckler (2002) and the developed countries investigated in Khalid and Guan (1999) also report there being little evidence of a relationship between the deficits.

In arguably the most empirically comprehensive study to date, Kim and Roubini (2008) report “twin divergence” in the U.S. over the flexible exchange rate period of 1973Q1-2004Q1. Through employing a BVAR, the authors show that an expansionary fiscal policy shock improves the current account and depreciates the real exchange rate. A partial ‘Ricardian’ reaction in private savings increasing and investment declining in response to fiscal shocks causes the current account to improve. In addition, their baseline model demonstrates that output shocks are largely responsible for producing the “twin divergence.” More precisely, output shocks improve the fiscal account which is consistent with the automatic-stabilizer role of the government budget and a pro-cyclical budget balance. These same shocks produce a decline in the current account balance which is in line with the predictions of most theoretical models.<sup>24</sup> The paper therefore concludes that output shocks – more so than fiscal shocks – appear to drive the co-movement of the two balances.

Outside of empirical analyses, several theoretical models have produced simulated data in considering the twin deficit hypothesis. Corsetti and Müller (2008) analyses the hypothesis through the lenses of an international real business-cycle (IRBC) model. Calibrated for the U.S., their model predicts a perfect positive correlation between the budget balance and trade balance in the face of fiscal shocks. This correlation, however, did not imply an economically significant effect in their impulse response analysis. They find only a very small effect of the budget balance on the trade account when the economy is relatively closed. In addition to the IRBC, the paper also considers data from the U.S. and nine other OECD countries. The authors find that the correlations of the two balances are for the most part negative but that this is less true in more open economies. Other theoretical studies include the calibrated dynamic stochastic general equilibrium models in Betts and Devereaux (2000) and Kollman (1998) and the New Open Economy Macroeconomic model in Obstfeld and Rogoff (1995).<sup>25</sup>

<sup>24</sup> See Mendoza (1991) and Backus, Kehoe and Kydland (1992) for discussions of such counter-cyclical responses.

<sup>25</sup> Betts and Devereaux (2000) show that temporary government spending shocks deteriorate the trade balance of the domestic economy. Kollman (1998) considers the impact of domestic and foreign productivity and fiscal policy shocks on the U.S. trade balance. U.S. productivity changes appear to be the main source of trade balance fluctuations in their model.

As can be gathered from the above, the literature on the twin deficit hypothesis is yet to arrive at a consensus regarding the true relationship between budget and current account deficits. To what extent this can be put down to differing sample periods, methodologies or country specific dynamics is not immediately clear. This aside, the literature does provide us with an arsenal of econometric tools through which the impact of post-apartheid fiscal policy can be measured. The following two sections therefore progress to provide details on the nature of our selected data and methodology whilst also considering some preliminary tests of the fiscal policy current account relationship.

## 4 Data and preliminary tests

### 4.1 Data and preliminary diagnostics

Data for this study cover the period 1994Q1 to 2011Q2 and are primarily taken from the South African Reserve Bank Quarterly Bulletins. Extended samples of (1987Q1-2011Q2) and (1989Q1-2011Q2) are also considered at various points to provide for greater degrees of freedom and to serve as a check of robustness.<sup>26</sup> The baseline model consists of five variables, namely GDPG, BB, CA, RIR and REER. These are the real GDP growth rate, the deseasonalised budget and current account balances as a per cent of GDP, the ex post real interest rate calculated as CPI inflation less the yield on short-term (0-3 month) government bonds and the log of the real effective exchange rate, respectively.<sup>27</sup>

Naturally, BB and CA are the key variables of interest in this study but strong motivation can be made for the inclusion of the three mediating variables of GDPG, REER and RIR, partially following the contribution of Kim and Roubini (2008). GDP growth is the vital macro variable representing economic performance and controls for the business cycle's impact on the fiscal balance. Thus, "exogenous" BB shocks can be identified through this control.<sup>28</sup> As Corsetti and Müller (2008) argue, any assessment of the co-movement of the budget and trade balance should take into account that both variables adjust endogenously, not only to fiscal shocks, but the entire state of the economy. The RIR and REER are important macroeconomic variables in the sense that they capture the channels through which fiscal policy can be transmitted to the current account. Beyond the proposed impact suggested in the indirect effect of budget balances on the current account, the RIR also controls for monetary policy in South Africa.

---

<sup>26</sup> We start the extended sample at 1987Q1 for two reasons. Firstly, it was around this point that many of the recommendations of the 1985 De Kock Commission Report were implemented and monetary policy in South Africa took a significant step toward becoming what it is in its current form. Secondly, du Plessis and Kotzé (2010) found a significant break in the variance of GDP at 1986Q1. The second extended sample of (1989Q1-2011Q2) allows us to determine whether there is any change in the behaviour of the variables in the wake of this break.

<sup>27</sup> See the appendix for details on this data.

<sup>28</sup> (Kim & Roubini, 2008)

Figure 2: Line plots of the series

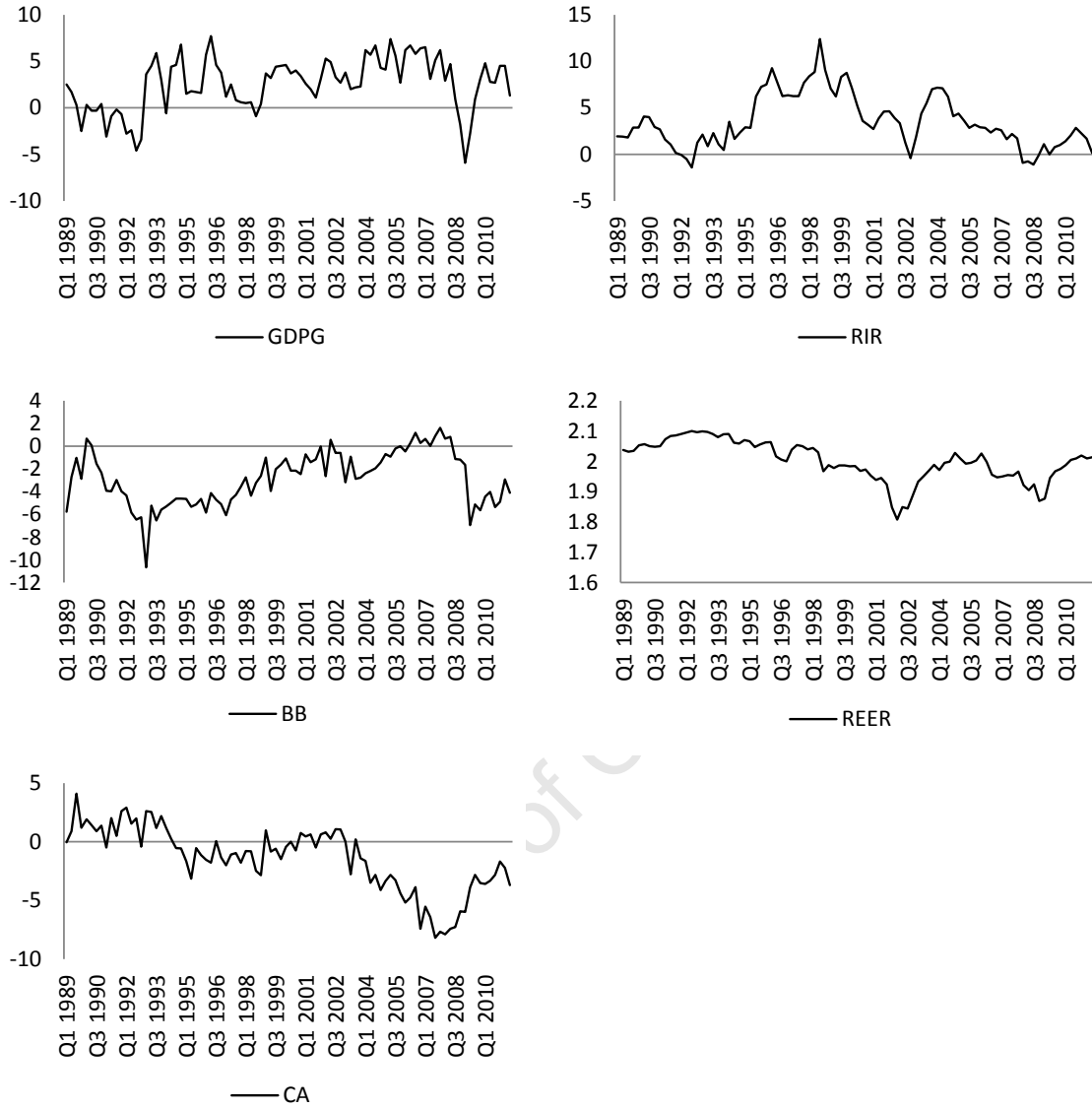


Table 1. Unit roots

	Test Statistics			
	$\tau_{\mu}$	$\tau_{\tau}$	$\tau_{\mu}$	$\tau_{\tau}$
	A: Levels		B: First Differences	
GDPG	-4.052842***	-4.001891***	-8.802316***	-8.735013***
BB	-1.865036	-1.574068	-13.08937***	-13.12472***
CA	-1.733597	-1.895555	-11.64019***	-11.57122***
RIR	-1.925977	-3.066985	-7.345963***	-7.332185***
REER	-2.235009	-1.871025	-6.949819***	-6.974783***

Notes: The first and third columns report the test statistics for the ADF tests with mean and the second and fourth columns report the statistics for the tests with mean and trend. \*\*\* denotes significance at the one per cent level. The number of lags was chosen according to the Schwarz Information Criterion.

Figure 2 illustrates the respective time series in the baseline model. The budget balance and current account have already been discussed in some detail but the points of interest in the remaining series can be noted. Seen in the GDPG plot, South Africa's growth progressed from the relative volatility of the late 80s and early 90s to the period of stable real economic growth characteristic of the "great moderation".<sup>29</sup> This was of course interrupted by the financial crisis toward the end of 2007 which brought a significant slowdown in economic activity. South Africa's real interest rate has experienced substantial movements with the distinctive high rates of the late 1990s being seen above. In terms of the REER, the memorable sharp depreciations in the rand in 2001 and 2008 can easily be observed. For the most part, however, the variable appears to be considerably less volatile than the others at a quarterly frequency.

Following the above plots, we investigated the time series properties of the data. Conventional unit root (Augmented Dickey-Fuller) tests were employed on the variables in their levels and first differences. Table 1 above reports the results of these tests. In panel A, the null hypothesis of a unit root is rejected for the GDPG series in tests with both mean and trend, with the remainder of the variables being affirmed nonstationary at the five per cent level. In panel B, all of the null hypotheses were rejected at the one per cent level. All of the series are therefore concluded to be  $I(1)$  with the exception of GDPG which is concluded to be  $I(0)$ .<sup>30</sup>

#### 4.2 Preliminary tests: cointegration analysis

Prior to conducting the central VAR analysis of this paper, we briefly consider the results obtained from a cointegration analysis between the current account and budget balance.<sup>31</sup> We employ Engle-Granger cointegration tests between the current account and budget balances controlling for the possibility of structural breaks. These are permitted to take the form of either a level shift or a regime shift, with the latter being the less restrictive form of break. This is done on the baseline sample of (1994Q1-2011Q2) and the extended sample of (1987Q1-2011Q2). The presence of a cointegrating relationship between the current account and budget balance would suggest that the two do not move independently of one another. As Daly and Siddiki (2009) argue, a greater than zero cointegrating coefficient would indicate that the two experience positive long-run co-movement and are linked in the Keynesian sense. The absence of cointegration between the two balances would conversely provide support for the REH.

<sup>29</sup> The experiences of many developed and developing countries since the volatile 1970s were characterised by low and stable inflation and stable real economic growth. This period was subsequently dubbed the "great moderation". A similar moderation has been reported for South Africa since the early to mid-1990s (Du Plessis & Kotze, 2010).

<sup>30</sup> ADF tests on the extended samples reached the same conclusions.

<sup>31</sup> Several papers in the literature approach the twin deficit question via cointegration analysis. See Daly and Siddiki (2009), Mohammadi and Skaggs (1996) and Leachman and Francis (2002) for good examples of more comprehensive analyses.

The Engle and Granger (1987) approach in this context is very similar to that of Gregory and Hansen (1996) cointegration, with the central difference being that the Gregory and Hansen (GH) procedure determines the single break date endogenously, whilst we identify it exogenously. More specifically, the GH procedure places the break date at the point where the ADF or Phillips test statistic results in the strongest rejection of the null of no cointegration. We differ from this in selecting the break date where the dummy alternative to the Chow test indicates the most significant break point.

The standard cointegration model run not permitting structural change takes the form

$$CA_t = \alpha_1 + \beta_1 BB_t + \varepsilon_t \quad (\text{Model I})$$

Gregory and Hansen (1996) propose three other models permitting structural change which we tailor to our bivariate case. These are

$$CA_t = \alpha_1 + \alpha_2 \gamma_t + \beta_1 BB_t + \varepsilon_t \quad (\text{Model II})$$

$$CA_t = \alpha_1 + \alpha_2 \gamma_t + \beta_2 T + \beta_1 BB_t + \varepsilon_t \quad (\text{Model III})$$

$$CA_t = \alpha_1 + \alpha_2 \gamma_t + \beta_1 BB_t + \beta_3 BB_t \gamma_t + \varepsilon_t \quad (\text{Model IV})$$

where  $\gamma_t$  is a dummy variable taking a value of zero prior to the structural break and a value of 1 thereafter. Model II allows for a level shift, Model III allows for a level shift and controls for a trend term  $T$  and Model IV permits a level shift and the possibility of a shift in the slope coefficient in the cointegrating equation (or otherwise a regime shift). All of the tests placed the break date at 2004Q2.<sup>32</sup> The results from models I-IV on both samples are contained in table 2 below.

**Table 2: Cointegration tests**

Model	Sample	Coefficients					ADF test statistic	R-squared
		$\alpha_1$	$\alpha_2$	$\beta_1$	$\beta_2$	$\beta_3$		
Model I	1987Q1-2011Q2	-2.827 (0.000)		-0.619 (0.000)			-2.384 (0.017)	0.207
	1994Q1-2011Q2	-3.468 (0.000)		-0.456 (0.001)			-1.601 (0.103)	0.158
Model II	1987Q1-2011Q2	-0.424 (0.291)	-4.724 (0.000)	-0.280 (0.003)			-3.590 (0.000)	0.621
	1994Q1-2011Q2	-1.223 (0.001)	-3.756 (0.000)	-0.180 (0.038)			-3.895 (0.000)	0.671
Model III	1987Q1-2011Q2	1.821 (0.001)	-2.149 (0.001)	-0.184 (0.028)	-0.056 (0.000)		-3.365 (0.001)	0.713
	1994Q1-2011Q2	-1.971 (0.000)	-4.826 (0.000)	-0.215 (0.014)	0.032 (0.055)		-4.321 (0.000)	0.689
Model IV	1987Q1-2011Q2	0.029 (0.949)	-5.566 (0.000)	-0.151 (0.189)		-0.359 (0.060)	-3.740 (0.000)	0.635
	1994Q1-2011Q2	0.101 (0.794)	-5.638 (0.000)	0.252 (0.024)		-0.762 (0.000)	-2.586 (0.010)	0.767

Notes: The numbers in parentheses in columns 3-7 are the p-values associated with the t tests on the coefficients whilst those alongside the ADF test statistics are the one-sided Mackinnon (1996) p-values. The number of lags in the ADF tests were chosen according to the Schwarz Information Criterion.

<sup>32</sup> From viewing the line plot of the CA in figure 2, this break date is arguably unsurprising as the CA began a substantial downward trend only two quarters prior. What occurred toward the end of 2003 was a significant acceleration in portfolio and FDI flows into South Africa which caused a faster deterioration of the country's net foreign asset position (Searle & Touna Mama, 2010).

The ADF test statistics from Model I show that the null of no cointegration cannot be rejected at conventional significance levels for the post-apartheid sample. In the lengthened sample, however, the statistic achieves significance with a p-value of 0.017. The coefficient of interest,  $\beta_1$ , is negative and highly significant in both cases, indicating a negative relationship between the balances. Permitting a structural break in the form of a level shift results in the rejection of the null hypotheses of no cointegration with the level shifts being found to be highly significant. The cointegrating coefficients are, however, more muted when this break is permitted but still attain significance at conventional levels. If the true model is that of II, we would conclude that there is a negative long-run relationship between the current account and budget balance, which stands as preliminary evidence against the predictions of Keynesian theory.

Controlling for a level shift and a trend in the relationship, Model III also supports a conclusion of cointegration in both samples. In addition, the results also show that the negative relationship between the balances remains intact. Seen in the final two rows, the less restrictive regime shift model challenges the negative pre-break relationship to an extent. Whilst the ADF test statistics both support cointegration,  $\beta_1$  is no longer significant in the (1987Q1-2011Q2) sample and is positive and significant in the (1994Q1-2011Q2) sample. The shifts in this relationship following the break are, however, significantly negative in the shorter sample and marginally so in the extended sample. Regardless of what the true model is, there is very little support for a positive long-run relationship between the balances.

From this simple bivariate cointegration analysis, we would conclude that the current account and budget balance in post-apartheid South Africa (and in the extended sample) do not experience the positive co-movement that is suggested by conventional theory. Despite this, we argue that such analysis, which is common in the twin deficit literature, may not do justice to the question that this paper seeks to answer. Certainly, this is where this paper derives its motivation for the use of VAR modelling. The argument hinges on the interpretation of settings in which these two different methodologies are applied. The BVAR allows for a dynamic multivariate and higher frequency analysis that determines the relationships between the variables controlling for a wide range of channels of transmission suggested by economic theory. The bivariate cointegration, on the other hand, simply tells of whether there is a long-run relationship between the balances and is not illuminating of the links that exist between them. We have noted additionally that both the current account and budget balance are likely to adjust endogenously to the state of the economy. This is certainly something which cannot be omitted and is better implemented in a higher frequency analysis. We therefore opt to base the core of our analysis on the more realistic dynamic setting provided by the BVAR model. The next section progresses to explain the chosen methodology and justify the decision to use Bayesian over classical inference methods.

## 5 Methodology

Although not explicitly stated previously, a great proportion of the papers cited in section 3 employ classical VARs. These have proven to be very useful for the purposes of the twin deficit literature, but are not without their limitations. One of the central drawbacks is that VARs require the estimation of a large number of parameters, some of which may be insignificant. In very large samples, this is naturally less of a concern but very often, samples of a sufficient size are not available. As Koop and Korobilis (2009) and Gupta and Kabundi (2011) argue, the problem of over-parameterization often results in multicollinearity and a loss of degrees of freedom, which leads to inefficient estimates and large out-of-sample forecasting errors. In addition to this problem, there is also the question of how nonstationarity is managed. Employing Bayesian inference methods can offer several key advantages over the classical VAR approach in dealing with these problems. Documented in Doan, Litterman and Sims (1984), Litterman (1986) and Fernández-Villaverde (2010), BVARs offer strong forecasting ability, are better equipped to deal with the loss of degrees of freedom in small samples and allow for the researcher to arrange and utilize pre-sample information in a systematic manner.<sup>33</sup> More importantly, unit roots do not require specific methods, as is necessary in classical inference.<sup>34</sup> Mentioned in section 3, an example of this type of study is that of Kim and Roubini (2008) whose contribution provides a useful starting point for the analysis of this paper.

### 5.1 Bayesian-VARs<sup>35</sup>

Exactly how BVARs deal with the problem of over-parameterization centres on the author eliciting a prior for the model. Rather than reduce the number of lags in the model or impose incredible restrictions, Doan *et al.* (1984) were the first in a line of many authors to propose the use of Bayesian prior information in a VAR context. As an example, what has since become known as the Minnesota prior sets the pre-sample means of the coefficients associated with the first own lags of the dependent variables to unity. This is in the belief that these lags contain more useful information. The coefficients on the remaining explanatory variables in each equation are given prior means of zero, illustrating that these variables are believed to represent less important information. In formal terms

---

<sup>33</sup> As is put forward in Fernández-Villaverde (2010), pre-sample information is often incredibly rich. Not taking advantage of it, in his opinion, is an unforgivable omission. Certainly with limited data, Bayesian inference allows for a researcher to “make the best of a bad situation.” See this paper for a full discussion of the advantages of Bayesian inference over classical inference.

<sup>34</sup> See Sims and Uhlig (1991) for a discussion of Bayesian inference in the presence of unit roots.

<sup>35</sup> This section draws significantly on the discussions of Bayesian VARs contained in LeSage (1999) and Gupta and Kabundi (2011).



$$\beta_i \sim N(1, \sigma_{\beta_i}^2) \quad (5.1)$$

$$\beta_j \sim N(0, \sigma_{\beta_j}^2) \quad (5.2)$$

where the  $\beta_i$  are the coefficients on the lags of the dependent variable and the  $\beta_j$  represent any other coefficient. The prior variances of  $\sigma_{\beta_i}^2$  and  $\sigma_{\beta_j}^2$  specify uncertainty surrounding these prior means. These play the crucial role of allowing the data to override the assumptions surrounding the prior means if there is important information to be captured. At this stage, the VAR still requires the estimation of a large number of parameters, but Doan et al. (1984) advocated the use of the following formula to generate the large number of standard deviations based on the selection of a few hyperparameters and a weighting matrix.

$$\sigma_{ijp} = \theta w(i, j) p^{-\emptyset} \left( \frac{\hat{\sigma}_{uj}}{\hat{\sigma}_{ui}} \right) \quad (5.3)$$

In the above equation,  $\sigma_{ijp}$  represents the standard deviation of variable  $i$  in equation  $j$  at lag  $p$ , the hyperparameters are  $\theta$ ,  $\emptyset$  and the weighting matrix is  $w$ .  $\hat{\sigma}_{ui}$  is the estimated standard error from a univariate autoregression of variable  $i$  so that  $\frac{\hat{\sigma}_{uj}}{\hat{\sigma}_{ui}}$  is a scaling factor that adjusts for differing units of measurement. In terms of the hyperparameters,  $\theta$  is labelled the ‘overall tightness’ and reflects the standard deviation of the prior on the first lag of the dependent variable.  $p^{-\emptyset}$  is a lag decay function governed by ( $0 < \emptyset < 1$ ) and allows for the tightening of the prior around the mean as the lag increases. Plainly speaking, the standard deviation of the prior means of zero shrink as the lag length increases as more distant lags are believed to represent less important information. Finally, the weighting matrix element  $w(i, j)$  specifies the tightness of the prior on variable  $j$  in equation  $i$  relative to variable  $i$ . In the standard Minnesota prior,  $w$  is a symmetric matrix with ones in the diagonal and 0.5 elsewhere and  $\theta$  and  $\emptyset$  take on values of 0.1 and 1 respectively. This paper utilizes a Minnesota-type prior in the form of a Sims-Zha prior. Within this prior, the overall tightness is set to 0.6, the tightness of the prior around the AR(1) parameters is set to 0.1, the lag decay to 2 and the standard deviation around the intercept is set equal to 0.25.

## 5.2 The VAR model<sup>36</sup>

We assume the economy to be described by the following equation in structural form

$$G(L)y_t = C + \varepsilon_t \quad (5.4)$$

---

<sup>36</sup> This model discussion is based substantially on that laid out in Kim and Roubini (2000).

where  $G(L)$  is a coefficient matrix in the lag operator  $L$ ,  $y_t$  is an  $n \times 1$  vector of endogenous variables,  $C$  is an  $n \times 1$  vector of constants and  $\varepsilon_t$  is an  $n \times 1$  vector of structural disturbances. The disturbances in  $\varepsilon_t$  are assumed to be normally distributed, mean zero and uncorrelated. That is,  $\varepsilon_t \sim N(0, \sigma^2 I_n)$  where  $I_n$  is an  $n \times n$  identity matrix. We can estimate the reduced-form of the above

$$y_t = D + B(L)y_t + u_t \quad (5.5)$$

where  $D$  is the vector of intercepts,  $B(L)$  is the reduced-form coefficient matrix in the lag operator  $L$  with lag length  $p$  and  $u_t$  are the reduced-form residuals. As Kim and Roubini (2000) note, there are several ways to identify the structural shocks from the reduced-form residuals. One popular method of identification is to use the type of recursive system suggested by Sims (1980) which employs the Cholesky decomposition to orthogonalise the reduced-form residuals. Another approach is to allow for a non-recursive structure and place restrictions on the contemporaneous coefficient matrix based on an economic model. Formally, these restrictions can be shown if we decompose the  $G(L)$  matrix into two separate matrices and state that

$$G(L) = G_0 + G^0(L) \quad (5.6)$$

where  $G_0$  is the matrix containing the contemporaneous coefficients and  $G^0(L)$  contains the remaining coefficients. The parameters in the reduced-form equation and structural equation can then be shown to be related by  $B(L) = -G_0^{-1}G^0(L)$  and  $u_t = G_0^{-1}\varepsilon_t$ . If the  $n$  diagonal elements of  $G_0^{-1}$  are normalized, then at least  $n \times (n - 1)/2$  restrictions are needed to identify the shocks. In recursive VARs relying on the Cholesky decomposition,  $G_0$  has a lower triangular structure and the ordering of the variables entering the VAR is pivotal. In a non-recursive setting, the ordering of the variables no longer matters and  $G_0$  can have any structure as long as enough restrictions are imposed to identify the system.

### 5.3 Identification

In our baseline investigation, we employ a recursive identification scheme where the contemporaneously exogenous variables are ordered first. The identification scheme employed in the baseline VAR orders the variables as {GDPG, BB, CA, REER, RIR}. GDPG enters the VAR first as it can be argued that the budget balance is likely to respond contemporaneously to the level of economic activity within a quarter. This is certainly the case from a revenue generation point of view and controlling for GDPG in this

manner allows the model to identify ‘exogenous’ BB shocks and their effect on the current account.<sup>37</sup> CA is naturally placed to the right of BB as this is the relationship of interest in this study.

If we seek to obtain the impact of the real interest rate on the exchange rate, we would place the RIR to the left of REER. As Kim and Roubini (2000) notes, this may be unappealing for two reasons. Firstly, small open economies may be more concerned about the effects of exchange rate depreciations on their inflation rates and might react quickly to such pressures with interest rate tightening. Secondly, placing REER before RIR allows for such interpretation when there is simultaneous exchange rate depreciation and interest rate increases. We agree with this paper and argue that an identification scheme that allows for a contemporaneous response of monetary policy to exchange rate changes is more appropriate for the South African economy. Such an ordering may, however, limit the model’s ability to capture the Keynesian indirect effect through interest rates impacting the exchange rate. These two variables are therefore swapped at a later stage.<sup>38</sup>

## 6 Empirical Analysis

### 6.1 Impulse Response in the baseline VAR

From the baseline model’s results illustrated in figure 3, shocks to GDP growth appear to have a significant and long lasting effect on the variables under investigation. Given the significance of overall economic performance in such a model, it is necessary to cover these in some detail. GDP growth responses to shocks in itself are persistent, with only 50 per cent of the innovation dying out after 12 quarters. The response of the budget balance, although delayed, is positive and significant and is consistent with counter-cyclical fiscal policy and the role of automatic-stabilizers.<sup>39</sup> More precisely, a 2.5 per cent increase in the GDP growth rate results in a 1.5 per cent improvement in the country’s fiscal position after approximately 3 quarters. This effect is persistent with much of the positive response remaining until the twelfth quarter.

The behaviour of the current account following the GDPG shock is arguably the most peculiar. As Kim and Roubini (2008) highlight, traditional and modern theories of the current account predict a decline in the balance following such a shock. From an income-expenditure perspective, GDP growth leads to an

---

<sup>37</sup> (Kim & Roubini, 2008)

<sup>38</sup> The BIC showed that a model of 1 lag was not rejected in favour of a model of 2 lags whilst the AIC favoured the 2 lag model at a 95% confidence level. It was also felt that a model with 2 lags would be better able to capture economic interactions among variables with quarterly data, so this was selected.

<sup>39</sup> For comprehensive analyses on the cyclical policy of post-apartheid fiscal policy, see Du Plessis, Smit and Sturzenegger (2007), Du Plessis and Boshoff (2007) and Burger and Jimmy (2006).

Figure 3: Impulse responses in baseline model

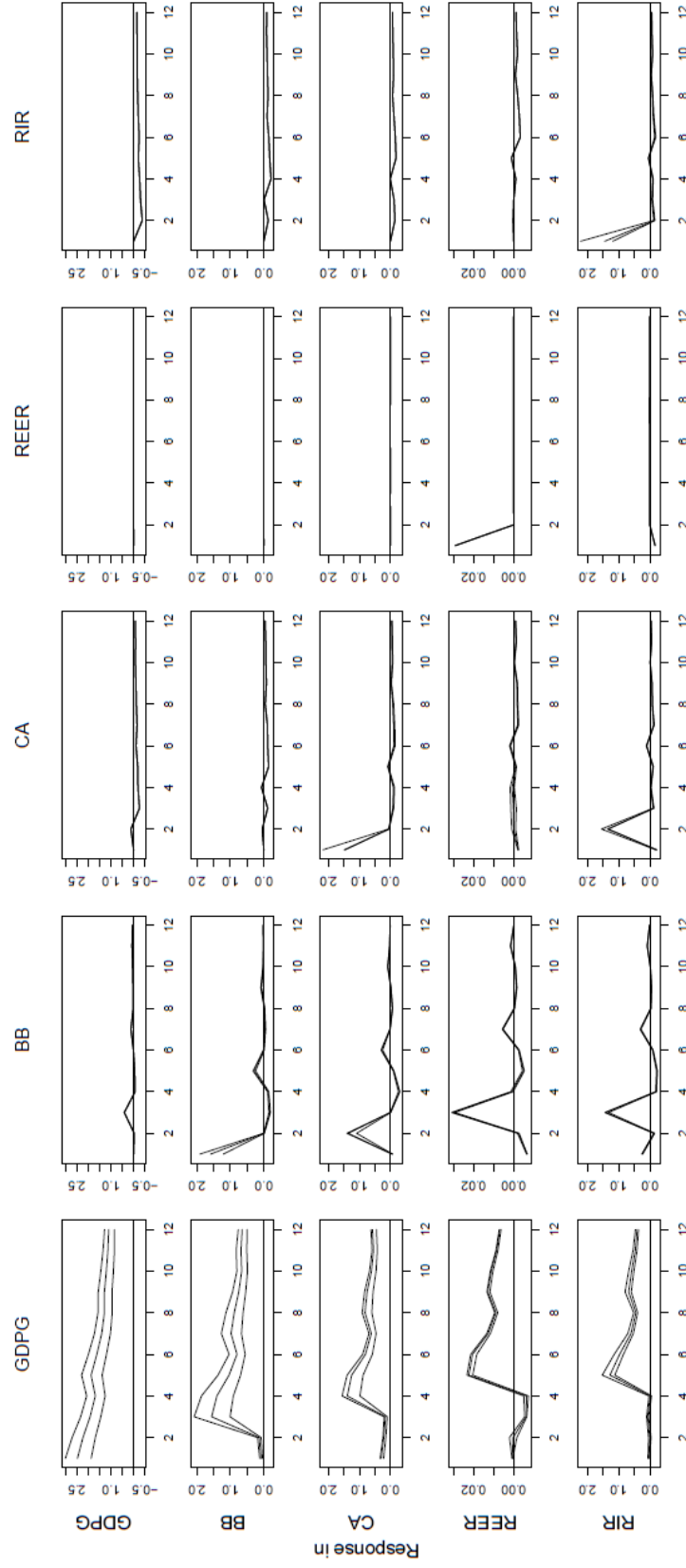


Figure 3. The responses of the variables in the baseline VAR to one standard deviation shocks in the others over a 12 quarter horizon. The columns contain the variable being shocked while the rows depict the responses. The one standard error bands (68% probability bands) are included.

increase in demand for foreign goods relative to domestic goods and therefore current account declines. From the modern perspective, productivity shocks lead to increased investment in the domestic economy and a worsening of the current account. Mendoza (1991) and Backus *et al.* (1992) provide evidence of the counter-cyclical behavior of the current account generated by productivity shocks in the U.S.<sup>40</sup> For the response to be counter-cyclical, the desire to increase investment must outweigh the pro-saving effect of the productivity shock. The exact distribution of the productivity shock across the economy, however, could also have differing implications for the response of the current account.<sup>41</sup> Exactly what effects are at work is not evident from the above impulse response. The positive and persistent reaction of the CA certainly runs counter to the *a priori* expectation and requires additional investigation.

After a year, the real effective exchange rate appreciates persistently in the face of GDPG innovations. Corsetti *et al.* (2006) found a similar response of the real exchange rate to U.S. and Japanese manufacturing productivity shocks. The real interest rate also experiences a delayed positive reaction to a GDPG increase. A possible interpretation of this is that a monetary contraction occurs in response to GDPG increases and the associated inflationary pressures. Such a statement is, however, difficult to verify given the shifts in monetary policy seen during the sample. Core inflation was only explicitly targeted post-1998 when the repo-system was implemented. Prior to this, monetary policy in South Africa was focused on preannounced M3 targets in a cost of cash reserves-based system.<sup>42</sup> Du Plessis (2006), however, finds strong evidence of stabilising monetary policy in South Africa in the post-1990 period of the paper's sample, which is partially reaffirming of this response.

Shifting focus to the main variable of interest in this section, budget balance innovations produce little or no response in GDPG. In fact, the lower triangular structure of figure 3 is unsurprising given structure of the contemporaneous coefficient matrix in the Cholesky decomposition. The response of BB to its own shock is not very persistent with a small overcorrection being seen between quarters 2 and 4. As the twin deficit hypothesis predicts, the current account improves in response to increased government saving. The current account improves by over one per cent of GDP in response to the 1.5 per cent increase in government saving – a very strong positive co-movement. Between quarters 3 and 5, a similar overcorrection in the current account is seen. The response of BB to its own shock could well bring about the decline in the current account balance after the third lag. Despite the differing trends in CA and BB

---

<sup>40</sup> Outside of these models, Backus and Kehoe (1989) show that a counter-cyclical response of the current account (trade) balance to be a key stylized fact of modern open economies.

<sup>41</sup> For instance, Corsetti, Dedola & Leduc (2006) find that productivity shocks in the U.S. manufacturing sector have dampening effect on the trade balance but argue that the international transmission mechanisms of economy-wide shocks are impossible to determine when the exact distribution of the shock is not known.

<sup>42</sup> (Aron & Muellbauer, 2001)

over the sample and the suggestions of the cointegration analysis, we can conclude that the twin deficit hypothesis appears to hold in post-apartheid South Africa given this strong positive co-movement.

Viewing the responses of the other mediating variables, one can determine whether this relationship is direct or indirect in nature. The RIR increases significantly in response to increased government saving which is in contrast with what theory predicts. To what extent budget balance improvements reduce inflationary pressures in the economy and increase the RIR is not known but could stand as a possible explanation. Regardless of this paradoxical effect, REER does not respond to increases in the real interest rate which stands as preliminary evidence against the Keynesian indirect effect.<sup>43</sup> Admitted above, the ordering in the Cholesky decomposition is not favourable to finding such a transmission mechanism. To provide a more favourable setting, we reordered the latter two variables so that the identification scheme became {GDPG, BB, CA, RIR, REER}. Not only was this done to provide a more favourable setting but the argument in line with Kim and Roubini (2000) regarding the placement of RIR to REER appeared to lack substance in the South African data. This can be seen in the non-response of the real interest rate to REER innovations. This reordering would also serve as an early robustness check on the direct effect found in figure 3. Somewhat surprisingly, RIR shocks did not have a significant impact on the REER. Uncovered interest parity condition (UIPC) predictions notwithstanding, there appears to be no significant relationship between the real interest rate and the real effective exchange rate in the VAR. Despite this, and most importantly, the reordering of the variables did not alter the other impulse responses highlighted as the central results of figure 3.

In summary of the above, the impulse responses show strong evidence of a twin deficit relationship in post-apartheid South Africa. The indirect effect operating through the REER and RIR appears to be absent whilst a strong case can be made for the presence of the direct effect. The current account balance responds positively to budget balance improvements with an overcorrection after 3 quarters. Output growth also appears to improve the current account persistently. The baseline VAR analysis has, therefore, provided us with an answer regarding the existence of a relationship between fiscal policy and the current account. To determine the exact dynamics at work behind the positive co-movement of South African output growth, the budget balance and current account, this paper proceeds to view private saving and investment behaviour in response to output and budget balance shocks.

---

<sup>43</sup> Increases in the RIR do, however, prompt a small negative response in output growth. The exact channel is not apparent from figure 3, but one could interpret this as illustrating a non-negligible impact of monetary policy on the real economy. Obstfeld and Rogoff (1995), Kim and Roubini (2000) and Kim (2001) find non-negligible reactions of real variables to monetary policy shocks.

## 6.2 Saving and Investment Behaviour

In order to view the impact of fiscal and output growth shocks on South Africa's disaggregated current account, we decomposed the current account into its different saving and investment components. From eq. 3.1, we can further separate investment into its private and public counterparts and give

$$CA = \text{Private saving} - \text{private investment} + \text{public saving (BB)} - \text{public investment} \quad (6.1)$$

where private investment is investment by all private enterprises and the public equivalent is investment by public corporations excluding the general government. A private saving series did not exist so this was calculated as the ratio of gross savings-to-GDP less the public saving-to-GDP ratio (or BB). There also existed a non-negligible statistical discrepancy (SD) between the actual current account and the current account derived from the sum of the four right hand side variables in (6.1).<sup>44</sup> This variable, SD, is included in the VAR to control for the unobserved differences between the CA balance in the baseline model and the current account components in this section. This allows us to isolate better the impact of GDPG and BB shocks on the saving and investment variables.

Seven variables were chosen to enter the recursive VAR. These were PUBINV, PRIVINV, PRIVSAV, SD, GDPG, BB and RIR. As their labels suggest, PUBINV and PRIVINV are public and private investment and PRIVSAV is private saving. Consistent with the BB series, these are all expressed as a per cent of GDP, as is the SD control. The shocks of interest were those of GDPG and BB, so these variables were included first. The real interest rate was included as this variable is a key determinant in saving and investment decisions in the economy. Placing RIR to the left of the private saving and investment variables would allow the VAR to capture the impact of this variable on these current account components, whilst also allowing it to respond to movements in public saving. The identification scheme, therefore, took the form {GDPG, BB, RIR, PUBINV, PRIVINV, PRIVSAV, SD}.<sup>45</sup>

Consistent with figure 3, shocks in GDPG produce a persistent improvement in the budget balance and a delayed but positive reaction in the real interest rate. This response in BB is significant after 2 quarters and peaks at an improvement of approximately 1.5 per cent of GDP. Investment by public corporations reacts negatively between quarters 0 and 4, although this response is small. Following this, however, a larger increase is seen peaking at a 0.2 per cent of GDP at quarter 5, with the response declining slowly thereafter. Similarly to public investment, private investment declines marginally in response to

---

<sup>44</sup> See the appendix for details on this data.

<sup>45</sup> Once again, the AIC showed that a 2 lag model was appropriate at conventional levels.

Figure 4. Saving/Investment Behaviour

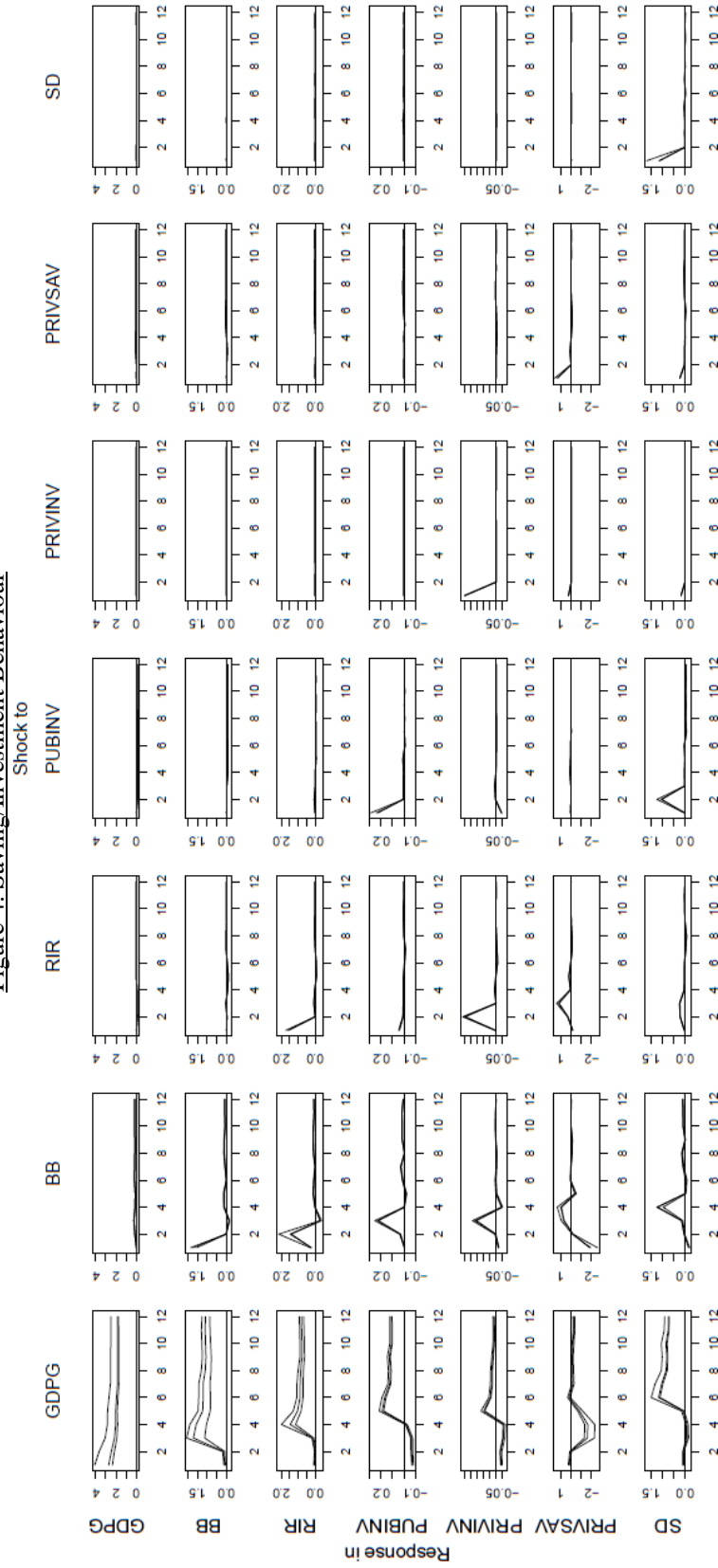


Figure 4. The effects of one standard deviation shocks in the seven variable model over a 12 quarter horizon. Once again the columns represent the variable being shocked whilst the rows represent the responses. GDPG, BB, and RIR are as in figure 2 whilst PUBINV, PRIVINV and PRIVSAV are public investment, private investment and private saving all as a percentage of GDP. SD is the statistical discrepancy between actual current account and the sum of the current account components. This is expressed as a per cent of GDP. One standard error (68% probability bands) are included.



GDPG shocks, with the reaction turning positive at the fourth lag. This positive reaction then peaks 5 quarters after the shock at 0.1 per cent of GDP. Taken together, these responses are consistent with the small open economy real business cycle model of Mendoza (1991).<sup>46</sup> Empirically, pro-cyclical South African investment is a result reported in both Rand and Tarp (2002) and Du Plessis (2006).

The final component of the current account, private saving, declines significantly after 2 quarters by around 1.5 per cent of GDP. The South African public appears to save less in response to a booming economy. Interestingly, the positive reaction in BB and negative reaction in PRIVSAV to output growth innovations almost exactly offset one another between quarters 2 and 4 leaving the net effect of the GDPG shock on the current account components being the initial, and marginally negative, responses of private and public investment.<sup>47</sup> This shows that increases in output growth marginally improve the current account within the first year of the output growth shock. Following lag 5, however, the negative response in private saving dissipates. This leaves the net effect of the GDPG shock on the current account comprising of the persistent increase in BB more than offsetting the increases in both investment variables to produce larger current account improvements. These combined movements help explain the peculiar counter-theoretical current account improvements seen in figure 3.

In response to budget balance increases, the real interest rate increases significantly as before. Public investment responds positively, with the greatest escalation seen at lag 3 of approximately 0.2 per cent of GDP. Private investment also responds positively to increased public saving but only does so after 2 quarters with the greatest response of a 0.15 per cent of GDP increase at the third lag. This effect serves to illustrate the reduction in ‘crowding out’ associated with fiscal contractions, although this effect appears to not operate through the interest rate channel. Arguably the most interesting response to BB shocks comes from PRIVSAV. Private saving declines immediately in response to increases in government saving. Unlike Kim and Roubini’s (2008) result, this ‘Ricardian’ reaction between lags 0 and 2 is more complete than partial, in that it almost entirely offsets the increase in public saving. Following quarter 2, this response turns positive with an increase of approximately one per cent of GDP, then declining at quarter 5. Given the relative absence of the BB shock after this lag, this large positive response in private saving more than offsets the increases in private and public investment. This renders the net positive effect of budget balance improvements on the current account components. Increased government saving

---

<sup>46</sup> Mendoza’s (1991) model with adjustment costs generates pro-cyclical movement in investment and savings.

<sup>47</sup> Rand and Tarp (2002) found a positive correlation between real gross savings and output in South Africa over the period 1961Q1-1999Q4. The net response of private and public saving in our model suggests little contemporaneous correlation between output growth and gross savings in the South African economy. It, however, does not exclude the possibility that output and savings have a positive correlation. Certainly the net response to GDPG shocks is positive over the 12 lags, which would suggest a positive correlation between these two variables.

therefore improves the current account through its positive impact on private saving as this reaction is larger than the positive response in private and public investment.

The baseline model in figure 3 showed that output and budget balance shocks both produced improvements in South Africa's current account balance. Decomposing the country's current account into its private/public saving and investment components has allowed for a possible explanation of these net effects, the first of which is peculiar and counter theoretical predictions. In response to output shocks, the delayed but net positive response of the current account appears to stem from this shock leading to persistent increases in public saving that exceed the increases in the investment variables. Following an initial offsetting Ricardian reaction in private saving, the net effect on the current account from budget balance improvements is similar, albeit less persistent. Budget balance improvements make room for private saving increases which more than offset the increases in public and private investment to improve the South Africa's current account.

## 7 Robustness

### 7.1 Baseline model variations

In verifying the robustness of the results contained in figure 3, we ran the baseline VAR on the two extended samples of (1987Q1-2011Q2) and (1989Q1-2011Q2). Comparing the impulse responses of the two models to those of figure 3 showed very little, if any, change in the reactions of current account, real effective exchange rate and real interest rate to budget balance shocks.<sup>48</sup> The responses all showed significant positive co-movement as before. Movements in the variables following GDPG innovations were very similar with the only tangible difference being seen in the faster convergence of the impulse responses in the extended samples.

The same lengthened samples were also applied to the alternate ordering of {GDPG, BB, CA, RIR, REER}. Despite the greater degrees of freedom, there was once again no evidence of the Keynesian indirect channel at work in these years. The remaining impulse responses experienced very limited change with the same faster convergence after GDPG movements being found. It was noted in the baseline VAR (and all variations run), that the real effective exchange rate had played little, if any, role. We therefore considered employing South Africa's terms of trade (TOT) as a replacement for this variable as it could provide an alternate story.<sup>49</sup> To be consistent with the baseline VAR, the ordering {GDPG, BB, CA, TOT, RIR} was selected and rendered limited change in the central results of figure 3.

---

<sup>48</sup> The impulse responses of the models on both extended samples can be seen in figure A1 and A2 in the appendix.

<sup>49</sup> By alternate story, we mean that nominal exchange rate appreciations (depreciations) would translate into immediate increases (decreases) in the terms of trade which could be interpreted accordingly.

In response to shocks in the other variables, the TOT series behaved very similarly to the real effective exchange rate. Certainly if prices are sticky and the nominal and real effective exchange rates move closely in line, we could expect REER and TOT to have a strong positive correlation. Running this model on the extended samples also produced no tangible change in the results. On an exploratory note, TOT was placed to the left of CA in an alternate ordering to observe if it played a role in current account determination. No significant movement in the current account was found following TOT shocks, which was somewhat surprising. The remaining central results of current account improvements following BB and GDPG shocks, however, remained intact. As discussed, this was the case for all of the above variations in the sample and orderings in the baseline model. This certainly served to increase our confidence in the results depicted in figure 3.

## 7.2. Saving Investment VAR variations

Regarding the robustness of the responses in figure 4, we ran the model with the ordering {GDPG, BB, RIR, PUBINV, PRIVINV, PRIVSAV, SD} on the extended data.<sup>50</sup> Following BB shocks, there appear to be no differences between figure 4's results and that of the longer samples. The same is true for the responses of the variables to output growth shocks but once again and unsurprisingly, these show faster convergence in both extended samples. We also considered the inclusion and position of the statistical discrepancy variable in the VAR.<sup>51</sup> Attaching interpretation to movements in this variable is unnecessary (or rather impossible) but its inclusion was motivated by the perspective that it would aid the model in isolating more accurately the responses of the remaining CA components to GDPG and BB shocks.

Removing SD from the VAR had very little impact on the responses of the saving and investment variables to output growth shocks. As such, the same net effect on the current account components endured this change. In response to budget balance improvements, private saving experienced an identical movement. The positive reactions in both investment variables were marginally smaller, suggesting that the exclusion of SD would bias upward the impact of BB shocks on the current account. This, however, was a relatively small bias of around 0.05 per cent of GDP. Including SD, but placing it to the right of RIR as opposed to the right of PRIVSAV, had no impact on the reactions of the current account components to GDPG and BB movements.

A final identification scheme was employed placing PRIVSAV to the left of the investment variables. This is arguably appropriate from the standpoint that saving is more likely to determine investment in an

<sup>50</sup> Once again, see the appendix for figure A3 and A4 for the impulse responses.

<sup>51</sup> Recall that this was calculated as the difference between the current account derived from the current account components (saving less investment) and the actual current account balance.

economy than the other way around.<sup>52</sup> A result that movements in this variable produce responses in investment would also be interesting and possibly be illuminating of a transmission channel from the budget balance to the current account. This was done with the SD variable included and excluded, but no effect was found suggesting that investment responds to private saving in the South African economy. The responses of the current account components to the key shocks to output growth and the budget balance under this ordering remained unchanged.

Regardless of the presence or position of SD in the VAR, or the use of the longer or shorter samples, the results that the current account improves in response to GDPG and BB shocks were found to be robust. To reiterate the findings of section 6, the net positive response of current account following GDPG shocks stems from government saving increases more than offsetting the delayed increases in both public and private investment. The persistence of this CA improvement appears to owe itself to the persistence in the budget balance improvement following these shocks. Budget balance shocks, on the other hand, bring a lagged positive response in private saving, which more than offsets the increases in the investment variables which improves the current account balance. These responses are, however, significantly less persistent than the reactions following GDPG shocks.

## 8 Conclusion

This paper has examined the relationship between fiscal policy and the current account in post-apartheid South Africa. Following an initial conclusion of a negative long-run relationship suggested by a cointegration analysis, we adopted an arguably more realistic dynamic multivariate setting. The BVAR models showed that the current account balance responds positively to the budget balance improvements in our samples – a result consistent with the twin deficit hypothesis and several theoretical models. It was also found that faster GDP growth improves the current account persistently. Noted in the introduction, global imbalances have received a significant amount of attention from political and economic commentators and for good reason. South Africa has also not escaped this debate in the concern voiced over the size and sustainability of its current account deficits. This paper has found there to be a significant positive relationship between the government budget balance and the current account in South Africa in the post-apartheid era. Admittedly, there are many other determinants of the current account but we argue, especially in the light of the above findings, that this positive relationship is one of which policy makers should take heed. The sample we have observed is one generally characterised by fiscal

---

<sup>52</sup> This ordering could easily have replaced that employed in the VAR that produced figure 4. Such considerations were, however, not important for the purposes of that VAR.

prudence rather than undue expansions. Spending pressure in the future, however, could well change and alter the course of fiscal policy and the current account.

University of Cape Town

## References

- [1] ABELL, J. D. (1990). Twin Deficits during the 1980s: An Empirical Investigation. *Journal of Macroeconomics*, 12(1): 81-96.
- [2] AFEIKHENA, J. (2004). Privatisation and Regulation in South Africa. An Evaluation. Johannesburg: National Institute for Economic Policy.
- [3] ANORUO, E., & RAMCHANDER, S. (1998). Current account and fiscal deficits: Evidence from five developing economies of Asia. *Journal of Asian Economics*, 9(3): 487-501.
- [5] ARON, J., & MUELLBAUER, J. (2001). Estimating Monetary Policy Rules for South Africa. The Centre for the Study of African Economies Working Paper Series. (Oxford University: Oxford).
- [6] BACHMAN, D. D. (1992). Why Is the U. S. Current Account Deficit so Large? Evidence from Vector Autoregressions. *Southern Economic Journal*, 59(2): 232-240.
- [7] BACKUS, D. K., & KEHOE, P. J. (1992). International Evidence on the Historical Properties of Business Cycles. *American Economic Review*, 82(4): 864-88.
- [8] BACKUS, D. K., KEHOE, P. J., & KYDLAND, F. E. (1992). International Real Business Cycles. *Journal of Political Economy*, 100(4): 745-775.
- [9] BAHARUMSHAH, A. Z., LAU, E., & KHALID, A. M. (2006). Testing Twin Deficits Hypothesis using VARs and Variance Decomposition. *Journal of the Asia Pacific Economy*, 11(3): 331-354.
- [10] BETTS, C., & DEVEREUX, M. B. (2000). Exchange rate dynamics in a model of pricing-to-market. *Journal of International Economics*, 50: 215-244.
- [11] BLANCHARD, O. MILESI-FERRETTI, G. M. (2009). Global Imbalances: In Midstream? IMF Staff Position Note 09/29.
- [12] BURGER, P., & JIMMY, C. (2006). Should South Africa Have a Fiscal Rule? *South African Journal of Economics*, 74(4): 642-669.
- [13] COMMISSION OF INQUIRY INTO THE MONETARY SYSTEM AND MONETARY POLICY IN SOUTH AFRICA (1985). Final Report: The Monetary System and Monetary Policy in South Africa (RP 70/1984). Pretoria: Government Printer.
- [14] CORSETTI, G., & MÜLLER, G. J. (2008). Twin Deficits, Openness, and the Business Cycle. *Journal of the European Economic Association*, 6(2): 404-413.
- [15] CORSETTI, G., DEDOLA, L., & LEDUC, S. (2006). Productivity, External Balance, and Exchange Rates: Evidence on the Transmission Mechanism among G7 Countries. NBER WP 12483 (Cambridge, MA, National Bureau for Economic Research).
- [16] DALY, V., & SIDDIKI, J. U. (2009). The twin deficits in OECD countries: cointegration analysis with regime shifts. *Applied Economics Letters*, 16: 1155-1164.

- [17] DARRAT, A. F. (1988). Have Large Budget Deficits Caused Rising Trade Deficits? *Southern Economic Journal*, 54(4): 879-887.
- [18] DEPARTMENT OF FINANCE. (1995). Growth, Employment and Redistribution: A Macroeconomic Strategy. Pretoria: Department of Finance.
- [19] DIBOGLU, S. (1997). Accounting for U.S. current account deficits: an empirical investigation. *Applied Economics*, 29: 787-793.
- [20] DOAN, T., LITTERMAN, R., & SIMS, C. (1984). Forecasting and conditional projections using a realistic prior distribution. *Econometric Reviews*, 3: 1-100.
- [21] DRAPER, P. & FREYTAG, A. (2008). South Africa's Current Account Deficit: Are Proposed Cures Worse than the Disease? Johannesburg: South African Institute of International Affairs.
- [22] DU PLESSIS, S. (2006). Reconsidering the business cycle and stabilisation policies in South Africa. *Economic Modelling*, 23: 761– 774.
- [23] DU PLESSIS, S., & BOSHOFF, W. (2007). A fiscal rule to produce counter-cyclical fiscal policy in South Africa. Stellenbosch Economic Working Paper: 13/07.
- [24] DU PLESSIS, S., & KOTZÉ, K. (2010). The Great Moderation of the South African Business Cycle. *Economic History of Developing Regions*, 25(1): 105-125.
- [25] DU PLESSIS, S., SMIT, B., & STURZENEGGER, F. (2007). The Cyclicity of Monetary and Fiscal Policy in South Africa since 1994. *South African Journal of Economics*, 75(3): 391-411.
- [26] EDWARDS, S. (2004). Thirty Years of Current Account Imbalances, Current Account Reversals and Sudden Stops. NBER WP 10276 (Cambridge, MA, National Bureau for Economic Research).
- [27] ENDERS, W., & LEE, B.-S. (1990). Current Account and Budget Deficits: Twins or Distant Cousins? *The Review of Economics and Statistics*, 72: 373-381.
- [28] ENGLE, R., & GRANGER, C. (1987). Cointegration and error-correction: Representation, estimation, and testing. *Econometrica*, 55: 251-276.
- [29] FELDSTEIN, M., & HORIOKA, C. (1980). Domestic Savings and International Capital Flows. *Economic Journal*, 90: 314-329.
- [30] FERNÁNDEZ-VILLAYERDE, J. (2010). The econometrics of DSGE models. *Journal of the Spanish Economic Association*, 1: 3-49.
- [31] GORDHAN, P. (2011, 23 February). 2011 Budget Speech. Retrieved August 8, 2011, from National Treasury: <http://www.treasury.gov.za>.
- [32] GREGORY, A., W. & HANSEN, B. (1996). Residual-based tests for cointegration in models with regime shifts. *Journal of Econometrics*, 70: 99-126.

- [33] GUPTA, R., & KABUNDI, A. (2010). Forecasting Macroeconomic Variables in a Small Open Economy: A Comparison between Small- and Large-Scale Models. *Journal of Forecasting*, 29: 168–185.
- [34] IBRAHIM, S. B., & KUMAH, F. Y. (1996). Comovements in budget deficits, money, interest rates, exchange rates and the current account balance: some empirical evidence. *Applied Economics*, 28: 117–130.
- [35] ISLAM, M. F. (1998). Brazil's Twin Deficits: An Empirical Examination. *Atlantic Economic Journal*, 26(2): 121–128.
- [36] KAUFMANN, S., SCHARLER, J., & WINCKLER, G. (2002). The Austrian current account deficit: Driven by twin deficits or by intertemporal expenditure allocation? *Empirical Economics*, 27: 539–542.
- [37] KEARNEY, C., & MONADJEMI, M. (1990). Fiscal Policy and Current Account Performance: International Evidence on the Twin Deficits. *Journal of Macroeconomics*, 12(2): 197–219.
- [38] KHALID, A. M., & GUAN, T. W. (1999). Causality tests of budget and current account deficits: Cross-country comparisons. *Empirical Economics*, 24: 389–402.
- [39] KIM, S. (2001). International transmission of U.S. monetary policy shocks: Evidence from VAR's. *Journal of Monetary Economics*, 48: 339–372.
- [40] KIM, S., & ROUBINI, N. (2000). Exchange rate anomalies in the industrial countries: A solution with a structural VAR approach. *Journal of Monetary Economics*, 45: 561–586.
- [41] KIM, S., & ROUBINI, N. (2008). Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S. *Journal of International Economics*, 74: 362–383.
- [42] KOLLMANN, R. (1998). US trade balance dynamics: the role of fiscal policy and productivity shocks and of financial market linkages. *Journal of International Money and Finance*, 17: 637–669.
- [43] KOOP, G., & KOROBILIS, D. (2010). Bayesian Multivariate Time Series Methods for Empirical Macroeconomics. *Foundations and Trends in Econometrics*, 3: 267–358.
- [44] KOUASSI, E., MOUGOUË, M., & KYMN, K. O. (2004). Causality tests of the relationship between the twin deficits. *Empirical Economics*, 29: 503–525.
- [45] LEACHMAN, L., & FRANCIS, B. (2002). Twin Deficits: Apparition or Reality? *Applied Economics*, 34: 1121–1132.
- [46] LESAGE, J. P. (1999). *Applied Econometrics using MATLAB*. Retrieved August 15, 2011, from [www.spatial-econometrics.com](http://www.spatial-econometrics.com)
- [47] LITTERMAN, R. (1986). Forecasting with Bayesian Vector Autoregressions: Five Years of Experience. *Journal of Business & Economic Statistics*, 4(1): 25–38.
- [48] MANUEL, T. (2001, February 21). 2001 Budget Speech. Retrieved August 8, 2011, from National Treasury: <http://www.treasury.gov.za>.



- [49] MANUEL, T. (2008, February 2008). 2008 Budget Speech. Retrieved August 8, 2011, from National Treasury: <http://www.treasury.gov.za>.
- [50] MENDOZA, E. G. (1991). Real Business Cycles in a Small Open Economy. *American Economic Review*, 81(4): 797-818.
- [51] MOHAMMADI, H., & SKAGGS, N. T. (1996). U. S. Fiscal Policy and Trade Deficits: A Broad Perspective. *Southern Economic Journal*, 62(3): 675-689.
- [52] NATIONAL TREASURY. (2009). 2009 Medium Term Budget Policy Statement. Retrieved August 9, 2011, from National Treasury: <http://www.treasury.gov.za>.
- [53] NORMANDIN, M. (1999). Budget deficit persistence and the twin deficits hypothesis. *Journal of International Economics*, 49: 171-193.
- [54] OBSTFELD, M., & ROGOFF, K. (1995). Exchange Rate Dynamics Redux. *Journal of Political Economy*, 103(3): 624-660.
- [55] PAHLAVANI, M., & SALEH, A. S. (2009). Budget Deficits and Current Account Deficits in the Philippines: A Casual Relationship? *American Journal of Applied Sciences*, 6(8): 1515-1521.
- [56] RAND, J., & TARP, F. (2002). Business Cycles in Developing Countries: Are They Different? *World Development*, 30(12): 2071-2088.
- [57] SEARLE, P., & TOUNA MAMA, A. (2010). The Sustainability of South African Current Account Deficits. Economic Research Southern Africa (ERSA) WP 188.
- [58] SHIRAKAWA, M. (2011). Global Imbalances and Current Account Imbalances. in Financial Stability Review 15: Global Imbalances and Financial Stability, Banque de France.
- [59] SIEBRITS, F. K., & CALITZ, E. (2004). Should South Africa Adopt Numerical Fiscal Rules? *South African Journal of Economics*, 72(4): 759-783.
- [60] SIMS, C. A. (1980). Macroeconomics and Reality. *Econometrica*, 48(1): 1-48.
- [61] SIMS, C. A., & UHLIG, H. (1991). Understanding Unit Rooters: A Helicopter Tour. *Econometrica*, 59(6): 1592-1599
- [62] SIMS, C. A., & ZHA, T. (2006). Does Monetary Policy Generate Recessions? *Macroeconomic Dynamics*, 10: 231-272.
- [63] SMIT, B. (2007). The Sustainability of South Africa's Current Account Deficit. Paper presented at the biennial conference of the Economic Society of South Africa September 2007. Johannesburg.
- [64] TODA, H. Y., & YAMAMOTO, T. (1995). Statistical inference in vector autoregression with possibly integrated processes. *Journal of Econometrics*, 66: 225-250.
- [65] VAMVOUKAS, G. A. (1997). Have Large Budget Deficits Caused Increasing Trade Deficits? Evidence from a Developing Country. *Atlantic Economic Journal*, 25(1): 80-90.

[66] ZIETS, J., & PEMBERTON, D. K. (1990). The U. S. Budget and Trade Deficits: A Simultaneous Equation Model. *Southern Economic Journal*, 57(1): 23-34.

## Appendix

This appendix provides details on the variables employed in this study and their sources and contains several of the impulse responses referred to in the robustness section.

### Section 4

The variables in the baseline VAR {GDPG, BB, CA, REER, RIR} as explained in the text are the real GDP growth rate, the deseasonalised budget and current account balances as a percent of GDP, the log of the real effective exchange rate and the ex post real interest rate calculated as CPI inflation less the yield on short-term (0-3 month) government bonds, respectively. The GDPG series, budget balance and current account series can be found on the South African Reserve Bank's website ([www.resbank.co.za](http://www.resbank.co.za)) under the following codes:

KBP6006S	Gross Domestic Product (annualised quarter-on-quarter growth rate with seasonal adjustment performed by the SARB)
KBP4420K	National government budget balance as a percentage of GDP
KBP5380K	Balance on the current account as a percentage of GDP

The budget balance and current account as a per cent of GDP were extracted from this source and then deseasonalised by the Census X12 (additive) method. The CPI, REER and Treasury bill (government bond) rates were taken from the IMF's *International Financial Statistics* database at [www.imf.org](http://www.imf.org).

### Section 6.3

The variables included in the saving and investment VAR are GDPG, BB, public investment, private investment and private saving. The last three were all expressed as a per cent of GDP. There was no available data series on private saving so this was constructed as the ratio of gross saving to GDP less the BB series. This, therefore, gave a measure of the private saving-to-GDP ratio. Public investment comprises investment by public corporations as a per cent of GDP. We excluded government investment as this is already contained in the BB variable. Private investment is investment by private business enterprises. The list of the variables employed and their codes on the website are:

KBP6106D	Gross fixed capital formation – public corporations at 2005 prices. (deseasonalised by the SARB)
KBP6109D	Gross fixed capital formation – private business enterprises at 2005 prices. (deseasonalised by the SARB)
KBP6286L	Ratio of gross savings to GDP (deseasonalised by the SARB)

### *Section 7*

The details on the terms of trade variable employed in the robustness section are

KBP5037L	Terms of trade including Gold – 2005 base. (seasonally adjusted by the SARB)
----------	--

The impulse responses (figures A1-A4) of the extended sample BVARs can be seen below

University of Cape Town

Figure A1: Impulse responses in 1987Q1-2011Q2 sample

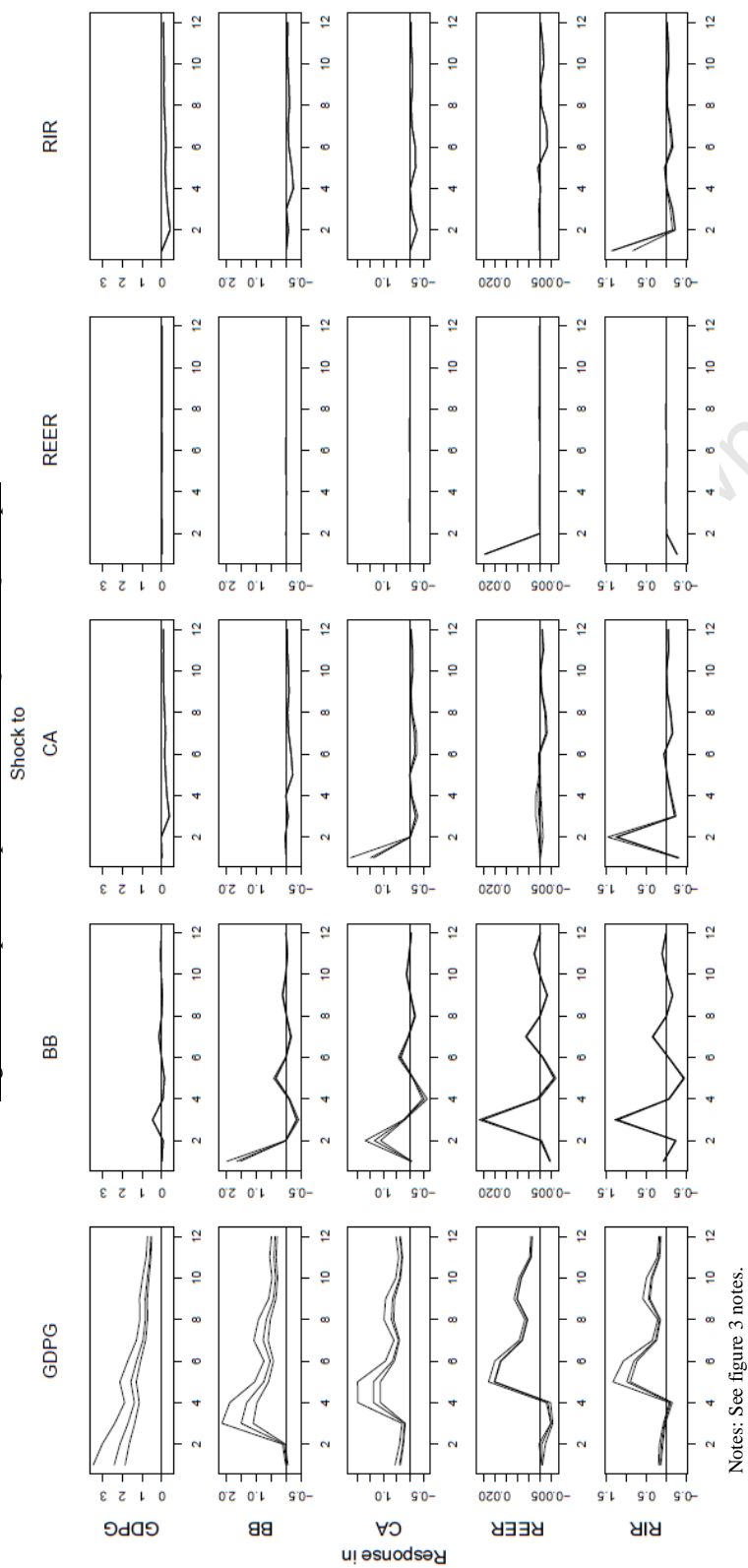
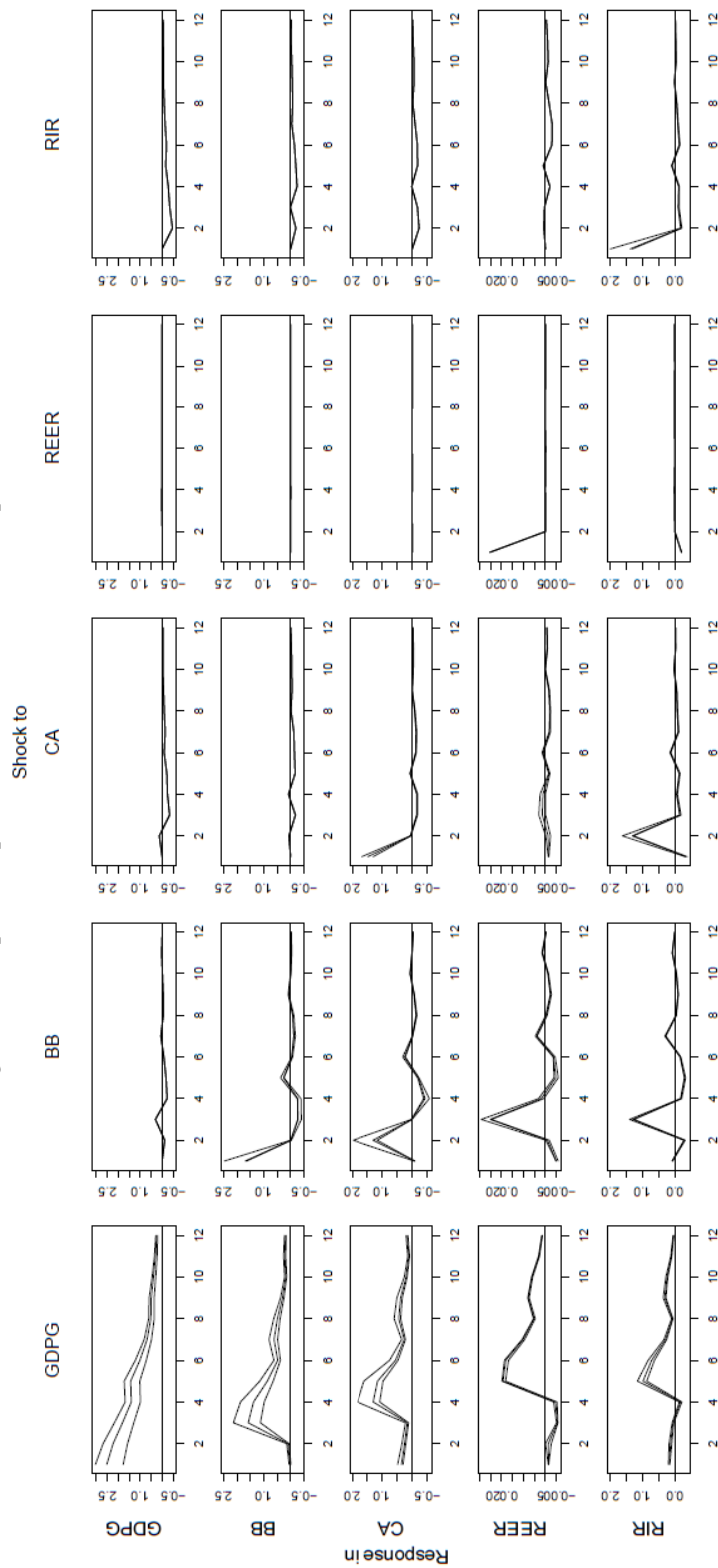
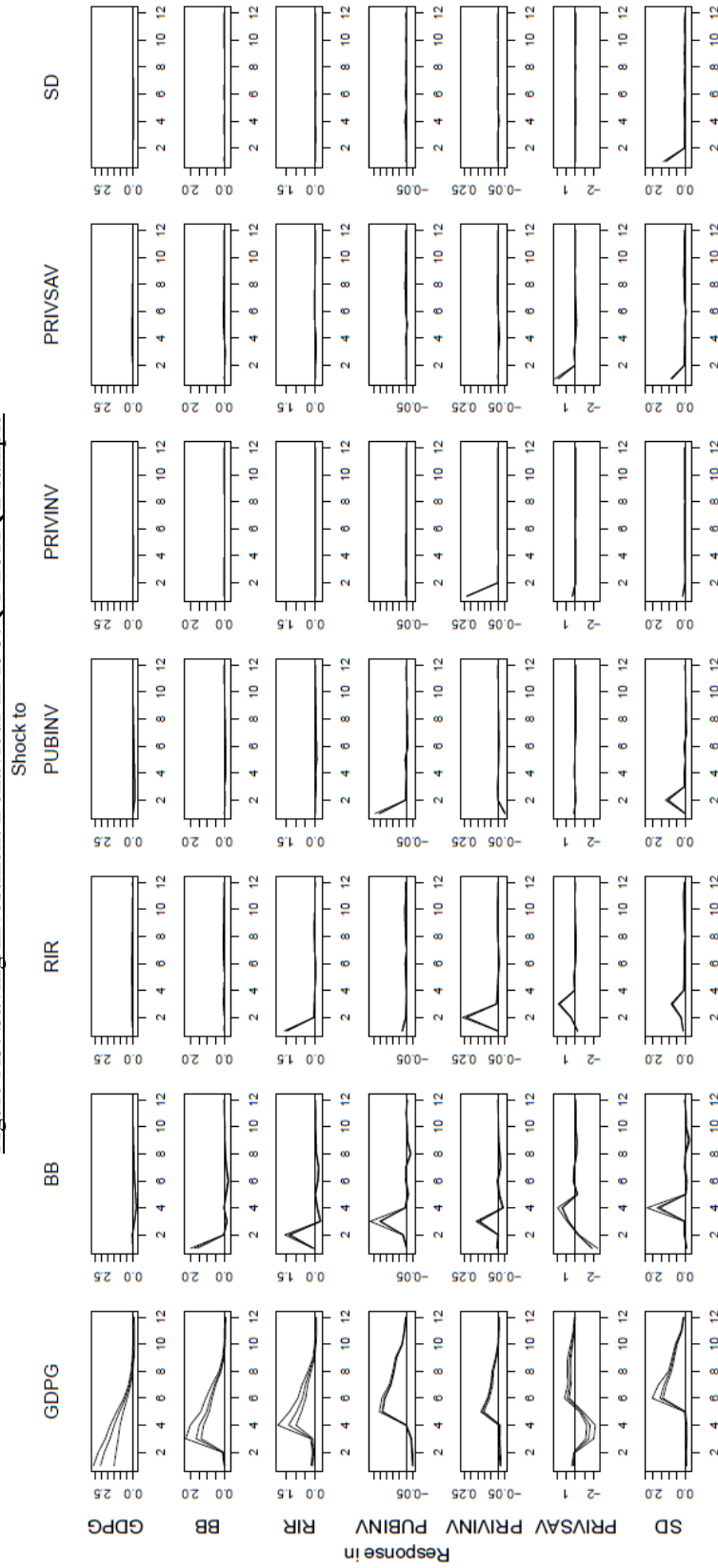


Figure A2: Impulse responses in 1989Q1-2011Q2 sample



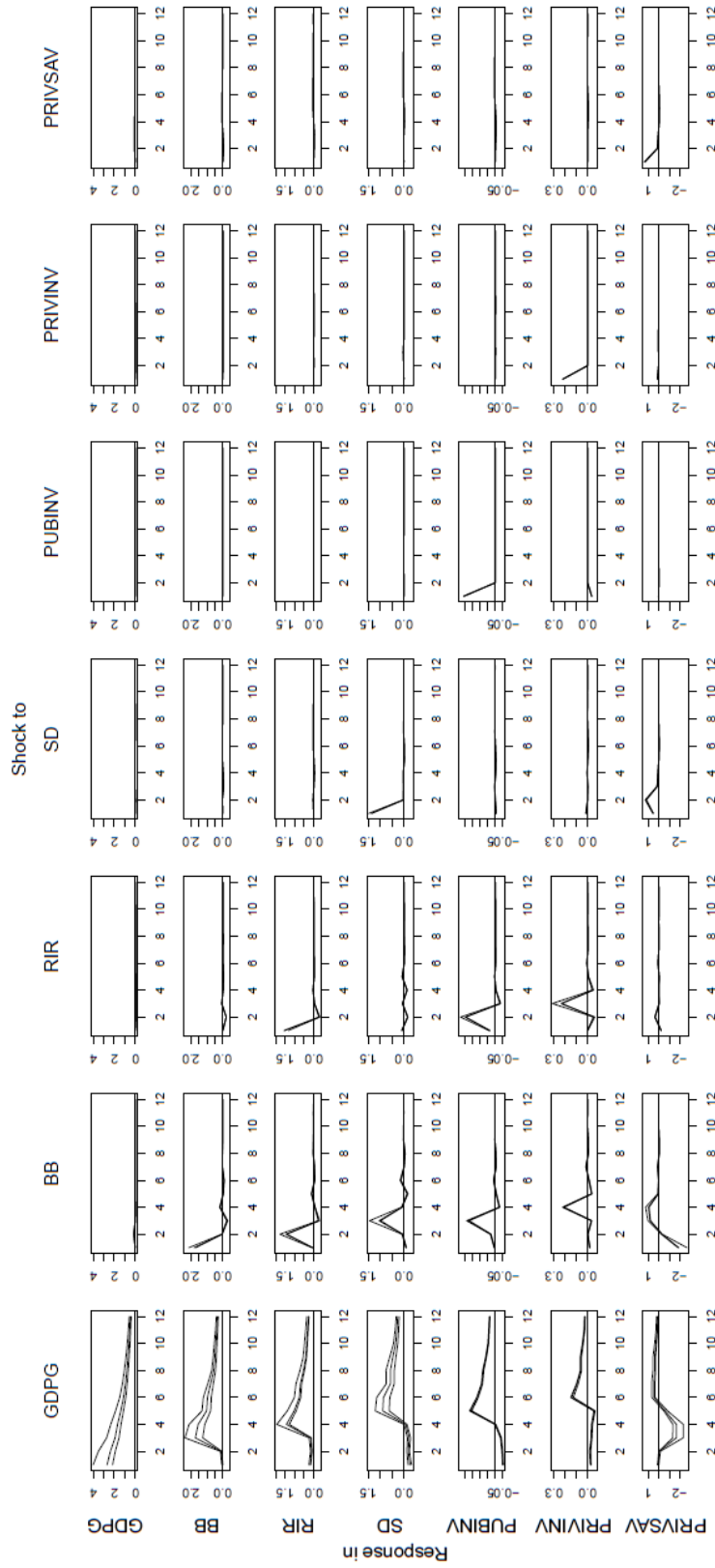
Notes: See figure 3 notes.

Figure A3: Saving/Investment Behaviour in 1987Q1-2011Q2 sample



Notes: See figure 4 notes.

Figure A4: Saving/Investment Behaviour in 1989Q1-2011Q2 sample



Notes: See figure 4 notes.